REMARKS

Claims 1-113 are pending in the present application. Claims 54-58 and 109-113 have been cancelled without prejudice or disclaimer to the subject matter contained therein. The Applicant reserves the right to file a divisional application directed to the subject matter of cancelled claims 54-58 and 109-113.

Rejection under 35 U.S.C. §102(e)

Claims 1, 3, 4, 7-14, 24, 25, 26, 28, 31-34, 37, 39, 59, 61, 64-71, 81, 82, 86-89, 92, and 94 have been rejected under 35 U.S.C. §102(e) as being anticipated by Gough (US Patent 6,816,200). This rejection under 35 U.S.C. §102(e) is respectfully traversed.

In formulating the rejection under 35 U.S.C. §102(e), the Examiner alleges that Gough discloses determining a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels (column 6, lines 27-54); determining an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels (column 6, lines 46-54); determining a transfer control function based on the determined illumination intensity level mapping function (column 6, lines 46-54); and imposing the determined transfer control function upon a pixel of the digital imager (Abstract). From the allegation, the Examiner has concluded that Gough anticipates the presently claimed invention. These allegations and conclusion are respectfully traversed.

Independent Claim 1

As set forth above, independent claim 1 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels; determines an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; determines a transfer control function based on the determined illumination intensity level mapping function; and imposes the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
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> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
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> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
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> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth determining a transfer control function based on the determined illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose the determination of a transfer control function based on the determined illumination intensity level mapping function. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, Gough fails to anticipate the presently claimed invention, as set forth by independent claim 1.

Independent Claim 26

As set forth above, independent claim 26 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a plurality of numbers of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels; determines a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels; determines a transfer control function based on the plurality of determined illumination intensity level mapping functions; and imposes the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
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> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by

> using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
>
> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
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> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth determining a transfer control function based on the plurality of determined illumination intensity level mapping functions.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

<u>Gough</u> fails to disclose the determination of a transfer control function based on the plurality of determined illumination intensity level mapping functions. <u>Gough</u> merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, <u>Gough</u> fails to anticipate the presently claimed invention, as set forth by independent claim 26.

Independent Claim 37

As set forth above, independent claim 37 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of saturated pixels; selects a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold; determines a number of pixels having illumination intensity levels within a defined range of values; selects a second illumination intensity level mapping function when the determined number of pixels is below a second threshold; determines a transfer control function based on the selected illumination intensity level mapping function; and imposes the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
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> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.

> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth determining a transfer control function based on the selected illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose the determination of a transfer control function based on the selected illumination intensity level mapping function. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, Gough fails to anticipate the presently claimed invention, as set forth by independent claim 37.

Independent Claim 59

As set forth above, independent claim 59 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
>
> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.

> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, Gough fails to anticipate the presently claimed invention, as set forth by independent claim 59.

Independent Claim 82

As set forth above, independent claim 82 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a plurality of number of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels and to determine a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the plurality of determined illumination intensity level mapping functions and to impose the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.

> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
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> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth a transfer control function generation circuit that determines a transfer control function based on the plurality of determined illumination intensity level mapping functions.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose a transfer control function generation circuit that determines a transfer control function based on the plurality of determined illumination intensity level mapping functions. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, Gough fails to anticipate the presently claimed invention, as set forth by independent claim 82.

Independent Claim 92

As set forth above, independent claim 92 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of saturated pixels and to select a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold, the illumination intensity level mapping controller determining an number of pixels having illumination intensity levels within a defined range of values and selecting a second illumination intensity level mapping function when the determined number of pixels is below a second threshold; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the selected illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.

> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
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> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
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> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth a transfer control function generation circuit that determines a transfer control function based on the selected illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

<u>Gough</u> fails to disclose a transfer control function generation circuit that determines a transfer control function based on the selected illumination intensity level mapping function. <u>Gough</u> merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Therefore, <u>Gough</u> fails to anticipate the presently claimed invention, as set forth by independent claim 92.

Dependent Claims

With respect to dependent claims 3, 4, 7-14, 24, 25, 28, 31-34, 39, 61, 64-71, 81, 86-89, and 94, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 1, 26, 37, 59, 82, and 92. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §102(e).

Rejection under 35 U.S.C. §103 over Gough in view of Fossum et al.

Claims 2, 5, 6, 15, 16, 19-23, 27, 29, 30, 40-47, 60, 62, 63, 72, 73, 76-80, 83-85, and 95-102 have been rejected under 35 U.S.C. §103 as being unpatentable over Gough (US Patent 6,816,200) in view of Fossum et al. (US Patent 6,906,745). This rejection under 35 U.S.C. §103 is respectfully traversed.

Independent Claim 41

As set forth above, independent claim 41 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value; determines an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; determines a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level; determines an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels; determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time; and imposes the determined transfer control function upon a pixel of the digital imager.

As previously established, Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
>
> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
>
> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.

> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth determining a transfer control function based on the determined illumination intensity level mapping function and the determined integration time.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose or suggest determining a transfer control function based on the determined illumination intensity level mapping function and the determined integration time. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Moreover, Fossum et al. fails to disclose or suggest determining a transfer control function based on the determined illumination intensity level mapping function and the determined integration time.

In summary, both Gough and Fossum et al., singly or in combination, fail to disclose or suggest determining a transfer control function based on the determined illumination intensity level mapping function and the determined integration time, as set forth by independent claim 41.

Therefore, the proposed combination of Gough in view of Fossum et al. fails to render the presently claimed invention obvious to one of ordinary skill in the art.

Independent Claim 96

As set forth above, independent claim 96 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value, and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; an exposure controller, operatively connected to the digital imager, to determine a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level, and to determine an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager, the exposure controller and the illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and the determined integration time and to impose the determined transfer control function upon a pixel of the digital imager.

As previously established, Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
>
> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
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> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

<u>Gough</u> fails to disclose or suggest a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time. <u>Gough</u> merely discloses the adjustment

of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Moreover, Fossum et al. fails to disclose or suggest a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time.

In summary, both Gough and Fossum et al., singly or in combination, fail to disclose or suggest a transfer control function generation circuit that determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time, as set forth by independent claim 96.

Therefore, the proposed combination of Gough in view of Fossum et al. fails to render the presently claimed invention obvious to one of ordinary skill in the art.

Dependent Claims

With respect to dependent claims 2, 5, 6, 15, 16, 19-23, 27, 29, 30, 40, 42-47, 60, 62, 63, 72, 73, 76-80, 83-85, 95, and 97-102, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 1, 26, 37, 41, 59, 82, 92, and 96. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Rejection under 35 U.S.C. §103 over Gough in view of Gallagher et al.

Claims 38, 52, 53, 93, 107, and 108 have been rejected under 35 U.S.C. §103 as being unpatentable over Gough (US Patent 6,816,200) in view of Gallagher et al. (US Patent 6,765,611). This rejection under 35 U.S.C. §103 is respectfully traversed.

Independent Claim 52

As set forth above, independent claim 52 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method selects a first illumination intensity level mapping function; determines a first transfer control function based on the

selected first compression; imposes the determined first transfer control function upon a pixel of the digital imager; determines a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon; determines an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram; determines a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager; determines a second transfer control function based on the determined second illumination intensity level mapping function; and imposes the determined second transfer control function upon a pixel of the digital imager.

As previously established, Gough discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, Gough discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, Gough, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
>
> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
>
> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor

> 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth determining a first transfer control function based on the selected first compression and determining a second transfer control function based on the determined second illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

Gough fails to disclose or suggest determining a first transfer control function based on the selected first compression and/or determining a second transfer control function based on the determined second illumination intensity level mapping function. Gough merely discloses the adjustment of the threshold voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Moreover, Gallagher et al. fails to disclose or suggest determining a first transfer control function based on the selected first compression and/or determining a second transfer control function based on the determined second illumination intensity level mapping function.

In summary, both Gough and Gallagher et al., singly or in combination, fail to disclose or suggest determining a first transfer control function based on the selected first compression and/or determining a second transfer control function based on the determined second illumination intensity level mapping function, as set forth by independent claim 52.

Therefore, the proposed combination of Gough in view of Gallagher et al. fails to render the presently claimed invention obvious to one of ordinary skill in the art.

<u>**Independent Claim 107**</u>

As set forth above, independent claim 107 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to select a first illumination intensity level mapping function; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a first transfer control function based on the selected first compression and to impose the determined first transfer control function upon a pixel of the digital imager.

The illumination intensity level mapping controller determines a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon.

The illumination intensity level mapping controller determines an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram.

The illumination intensity level mapping controller determines a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager.

The transfer control function generation circuit determines a second transfer control function based on the determined second illumination intensity level mapping function.

The transfer control function generation circuit imposes the second determined transfer control function upon a pixel of the digital imager.

As previously established, <u>Gough</u> discloses a process for detecting the intensity saturation of a camera sensor. Furthermore, <u>Gough</u> discloses, at column 6, lines 27-61, the monitoring of the pixel image data to determine whether the analog-to-digital converter and voltage detector should be programmed for a brighter scene or a darker scene depending upon the state of flags A and B.

More specifically, <u>Gough</u>, at column 6, lines 27-61, discloses:

> The logic of the XOR gate 42 is shown in FIG. 4. That is, when the input on line B to the XOR gate 42 is LO, then the output of the XOR gate is the same

> as the input on line A. The condition where A is LO and B is HI is impossible, since a LO signal on A would force B LO as well. When both A and B are both HI, then x is forced LO by the XOR gate 42.
>
> In FIG. 5, a process 56 for detecting camera sensor intensity saturation as implemented by a digital processor 18 begins at 58, and the flags "A" and "B" are cleared in an operation 60. Then, in an operation 62, the process "eavesdrops" on a frame of pixels; keeping a running count of bright and whiteout pixels. By "eavesdrops" it is meant that the process does not disturb the data flow, but merely monitors the pixel data as it is received. This is usually accomplished by using a few registers to keep count of certain pixel types, including bright and whiteout pixels. A "bright" pixel is near, but not yet at, saturation. A "whiteout" pixel is at saturation, and is designated by "1111111111" in this example.
>
> Next, in a decision operation 64, it is determined whether the number of whiteout pixels are [sic] greater than a threshold1 number. A typical threshold1 number for whiteout pixels depends upon the brightness of a scene, but for an average scene, the threshold1 may be about 20 whiteout pixels. If it is greater than the threshold1, an operation 66 sets flag A to indicate that the preprocessor 16 should be reprogrammed for a brighter scene. This is accomplished, at least in part, by reprogramming the ADC 50 and the voltage detector 38.
>
> Operation 68 determines whether the number of bright pixels is less than a threshold2, which is typically about 50, but which again is dependent upon the scene. If it is less than the threshold, operation 70 sets flat B to flag that the preprocessor 16 should be reprogrammed for a darker scene. This, again, is accomplished in part by reprogramming the ADC 50 and the voltage detector 38.

In contrast, the presently claimed invention specifically sets forth a transfer control function generation circuit that determines a first transfer control function based on the selected first compression and determines a second transfer control function based on the determined second illumination intensity level mapping function.

As defined in the specification, the manipulation or adjustment of the charge integration function of a pixel is known as the transfer control function of the digital imager. Charge integration function manipulation or transfer control function manipulation is realized through the changing of an integration time, T_{int}, for the digital imager. Changing the integration time, T_{int}, changes the start time of the transfer control function or charge integration period.

<u>Gough</u> fails to disclose or suggest a transfer control function generation circuit that determines a first transfer control function based on the selected first compression and/or determines a second transfer control function based on the determined second illumination intensity level mapping function. <u>Gough</u> merely discloses the adjustment of the threshold

voltage wherein the threshold voltage determines if the pixel is ON or OFF. The threshold voltage does not impact the integration time for a digital imager.

Moreover, Gallagher et al. fails to disclose or suggest a transfer control function generation circuit that determines a first transfer control function based on the selected first compression and/or determines a second transfer control function based on the determined second illumination intensity level mapping function.

In summary, both Gough and Gallagher et al., singly or in combination, fail to disclose or suggest a transfer control function generation circuit that determines a first transfer control function based on the selected first compression and/or determines a second transfer control function based on the determined second illumination intensity level mapping function, as set forth by independent claim 107.

Therefore, the proposed combination of Gough in view of Gallagher et al. fails to render the presently claimed invention obvious to one of ordinary skill in the art.

Dependent Claims

With respect to dependent claims 38, 53, 93, and 108, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 37, 52, 92, and 107. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Rejection under 35 U.S.C. §103 of claims 48-51 and 103-106

With respect to dependent claims 48-51 and 103-106, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 41 and 96. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Conclusion

Accordingly, in view of all the reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw the present rejections. Also, an early indication of allowability is earnestly solicited.

Respectfully submitted,

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